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February 28, 2005

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APPLICATION NUMBER: *60/580,489*
FILING DATE: *June 16, 2004*
RELATED PCT APPLICATION NUMBER: *PCT/US04/29849*

Certified by

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PROVISIONAL APPLICATION FOR PATENT COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c).

Express Mail Label No. EV 426313695 US

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☐ *Additional inventors are being named on the____ separately numbered sheets attached hereto*

TITLE OF THE INVENTION (500 characters max)

MAXIMIZED MICA CONTENT USING A SPECIALTY THIN HIGH TENSILE BACKING MATERIAL

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ENCLOSED APPLICATION PARTS *(check all that apply)*

☒ Specification *Number of Pages* 4 ☐ CD(s), Number _____

☐ Drawing(s) *Number of Sheets* _____ ☒ Other (specify) Return-Receipt Postcard; Express Mail Certificate

☒ Application Data Sheet. See 37 CFR 1.76

METHOD OF PAYMENT OF FILING FEES FOR THIS PROVISIONAL APPLICATION FOR PATENT

☐ Applicant claims small entity status. See 37 CFR 1.27.

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☐ Payment by credit card. Form PTO-2038 is attached.

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The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

☒ No.

☐ Yes, the name of the U.S. Government agency and the Government contract number are: _____

Respectfully submitted,

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Date JUNE 16, 2004

REGISTRATION NO. 41,779 *(if appropriate)*

Docket 2309.002P

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CERTIFICATE OF MAILING BY "EXPRESS MAIL"

In Re Application of **ROBERTS et al.**

Title: **MAXIMIZED MICA CONTENT USING A SPECIALTY THIN HIGH TENSILE BACKING MATERIAL**

Attorney Docket No.: **2309.002P**

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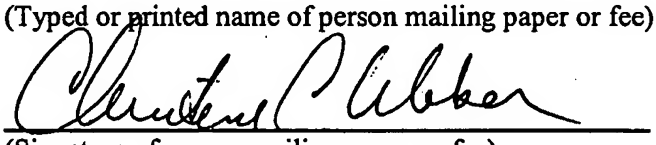

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DOCUMENTS INCLUDED with this Certificate Express Mail Label No. **EV 426313695 US**

* One (1) Acknowledgment Postcard;
* Provisional Application for Patent Cover Sheet (1 page);
* U.S. Provisional Patent Application (4 pages); and
* EFS Application Data Sheet (3 pages)

isovolta
Group

Provisional Patent Application

Inventor Jonathan Roberts
Co-Inventor: Dana Rackliffe
Co-Inventor: Daniel Bernatchy

1. Title: Maximized mica content using a specialty thin high tensile backing material

2. Background: Natural mica is converted to a continuous sheet product using a process very similar to that used to make paper. This continuous sheet of mica is referred to as mica paper, although it contains no cellulose fibers. Mica exhibits excellent electrical , chemical and high temperature resistance properties that makes it an ideal substrate for applications requiring these attributes. However, the paper manufactured solely from mica has relatively low tensile strength. Most final applications require that the mica paper be reinforced with some other material to prevent the fracturing of the paper while it is being placed into the application. A typical reinforcing backer material is woven glass fabrics. The individual yarns used to produce the glass fabrics are composed of many fine filaments. A common "G" designation contains 204 individual filaments with a nominal diameter of 0.00036 inches. The cross section of these filaments tend to be tubular. A typical total thickness of a glass fabric is 0.002 inches with a tensile strength of 90 pounds.

   The basis of the invention is the use of a new glass fabric that is base on flat yarns as opposed to the traditional round yarns. This product is sold by Dielectric Solutions under their trade name GlasFab® Direct. Flat filaments offer significant advantages that can not be achieved with the traditional yarns. These individual advantages offer specific performance characteristic that are in some cases application specific. The following summarizes the advantages and opportunities presented by using the flat filament fabrics

   a. Flat filaments are thinner and weave a thinner fabric than does a fabric using round yarns. This means that for a given final thickness of a typical glass fabric / mica paper composite, one can add more mica paper to the construction. Since it the mica paper that provides the desired characteristics of the insulating composite, one can therefore increase the mica content substantially. For example, a typical construction would be 2 mils

of Glass fabric and 3 mils of mica paper. Using the Dielectric Solution fabric style 1297, the same construction can be redesigned to 1.2 mils fabric and 3.8 mils of mica paper. This is an increase of 27% mica content. Another way to view this is to evaluate the mica to glass ratios. In the first example the mica to glass ratio is 1.5 as compared to 3.2 for the flat yarn example. This has real significance to our end customers, the motor and generator manufacturers. Such an increase of the primary insulation component will allow them to increase the stress on the insulation and to add more copper in the design. For a given machine size, it will allow for more power output. Thinner wall insulation on the coils of a generator will improve the thermal conductivity and allow the unit to operate cooler, which translate to improved operating life.

b. The flat filaments do not cut each other at the weave cross over and therefore a thinner fabric can maintain the high tensile properties. In the composite form, this means that the improved mica to glass ratio is not done at the sacrifice of tensile strength as would be the case for traditional round yarn based glass fabrics. This is significant in that the mica paper glass composites require a high tensile for final use by the customer.

c. Flat filaments provide significantly more surface area for bonding the fabric to the mica paper than does the round yarn based fabric. This is significant in that the bond at the interface between the glass fabric and the mica paper is often a point of failure during the customer application. Therefore one tries to maximize this interface bonding. The natural geometry of the flat yarn automatically yields a significantly improved bond over the round yarn based fabrics. This also means that the total resin content used to bond the fabric to the mica paper can be reduced resulting in a cost reduction.

d. Along the same lines as a., the volume of resin needed to fill the glass yarn is significantly reduced. A reduction in organic volume translates to improved voltage endurance performance of the insulation and better thermal conductivity of the insulation.

e. For insulating individual wires using the mica paper / glass fabric composite, one can take advantage of the thin glass to produced the desired thinner insulation. Again, for the same allowed space, the thinner insulation will allow for more copper, which translates to more power output.

f. Round yarn based fabrics in mica composites cause heavy ridges in the wrapped conductors. The flat yarn will yield a smoother and thinner wrap. In the case of insulated round wire, the smooth surface is desirable when extruding over the conductor. The final extruded layer on the wire can be thinner and smoother.

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4. Mica tape incorporating the specialty thin high tensile backing material is manufactured using the methods of US Patent Nos. 4,286,010, 4,374,892 and/or 4,704,322.

5. Description of flat glass specialty thin high tensile backing material, manufactured according to US Patent No. 6,581,257:

   Dielectric Solutions has developed a process that produces an ultra-lightweight glass fiber fabric that is thinner and stronger, with improved electrical and thermal properties, in half the number of fabrication steps of leading competitors' products.

   Two key elements distinguish Dielectric's process and end product: the fabric is made with yarns that are twist free, and the final fabric finish is applied before rather than after weaving. Dielectric has accomplished this by producing its own glass fiber, rather than relying on outside suppliers as its competitors do.

"Traditional glass fabric is made from yarns that are twisted like a rope, to give them additional strength," says Kadar. "Dielectric Solutions removes the twisting completely. The result is ribbon-like yarn that yields a very flat fabric where fibers are uniformly distributed."

Flatter fabric is a benefit for applications requiring a thinner, smoother surface. Dielectric's glass fabrics are thin enough to see straight through them.

"The fabric weighs as little as 1 oz. per square yard, containing glass fibers that are only 5 microns in diameter," explains Kadar. "That's about 1/20th the diameter of a normal human hair."

Fibers so small can be quite brittle, which is why traditional glass fabrication processes require that the fibers are coated with a chemical protective coating prior to weaving. This protective coating is then removed and a final finish is applied prior to shipment of the fabric to a customer.

"Typically, this final finish is put on after weaving to ensure compatibility with the customer's process," Kadar points out. At Dielectric Solutions, the final finish the customer wants is applied upfront in the first step, when we form the glass fibers. The change makes for a cleaner, higher-quality product that is also much stronger.

"Dielectric Solutions' process affords greater flexibility and eliminates inefficiencies. It's designed to be more responsive and better adapted for customized products with small volume," says Kadar. "Simply put, it performs better."

APPLICATION DATA SHEET

Electronic Version v14
Stylesheet Version v14.0

Title of Invention	MAXIMIZED MICA CONTENT USING A SPECIALTY THIN HIGH TENSILE BACKING MATERIAL

Application Type: provisional, utility
Attorney Docket Number: 2309.002P

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